FINAL

NASA (FIELD CENTER BASED) TECHNOLOGY COMMERCIALIZATION CENTERS

Final Report
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IC² Institute
The University of Texas at Austin

Executive Summary

Under the direction of the IC^2 Institute, the Johnson Technology Commercialization Center has met or exceeded all planned milestones and metrics during the first two and a half years of the NTCC program. The Center has established itself as an agent for technology transfer and economic development in the Clear Lake community, and is positioned to continue as a stand-alone operation.

This report presents data on the experimental JTCC program, including all objective measures tracked over its duration. While the metrics are all positive, the data indicates a shortage of NASA technologies with strong commercial potential, barriers to the identification and transfer of technologies which may have potential, and small financial return to NASA via royalty-bearing licenses. The Center has not yet reached the goal of self-sufficiency based on rental income, and remains dependent on NASA funding.

The most important issues raised by the report are the need for broader and deeper community participation in the Center, technology sourcing beyond JSC, and the form of future funding which will be appropriate.

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Introduction

The original IC^2 proposal for the NASA (Field Center Based) Technology Commercialization Centers summarizes the project and its experimental nature:

> *This effort is designed to determine the feasibility of an advanced concept for accelerated commercialization of NASA technology through full development and testing of NASA (Field Center Based) Technology Commercialization Centers (NTCC) over a three-year period. The NTCCs will facilitate transfer and commercialization of NASA technology by linking entrepreneurs, capital, market, and general business know-how. The NTCC will represent a unique opportunity to experiment with the commercialization of NASA technology through start-up companies launched under an innovative, guided, and value-added entrepreneurship model that has been pioneered by the IC^2 Institute and the Austin Technology Incubator, The University of Texas at Austin (UT).*

This report provides a fact-based analysis of the outcomes of the experimental project and, where possible, draws conclusions. The primary purpose is to present an objective framework of results which can serve as the basis for informed, meaningful discussion among key stakeholders in the project. It is distinct from the JTCC Operations and Procedures Manual, which attempts to capture procedural aspects of the center.

The original proposal set forth a three year experiment beginning November 1992. The project was initiated in March 1993 and concluded on September 30, 1995. This report covers the two and a half year period from March 1993 through September 1995 (encompassing portions of NASA Fiscal Years 93, 94, and 95), as shown in Figure 1.

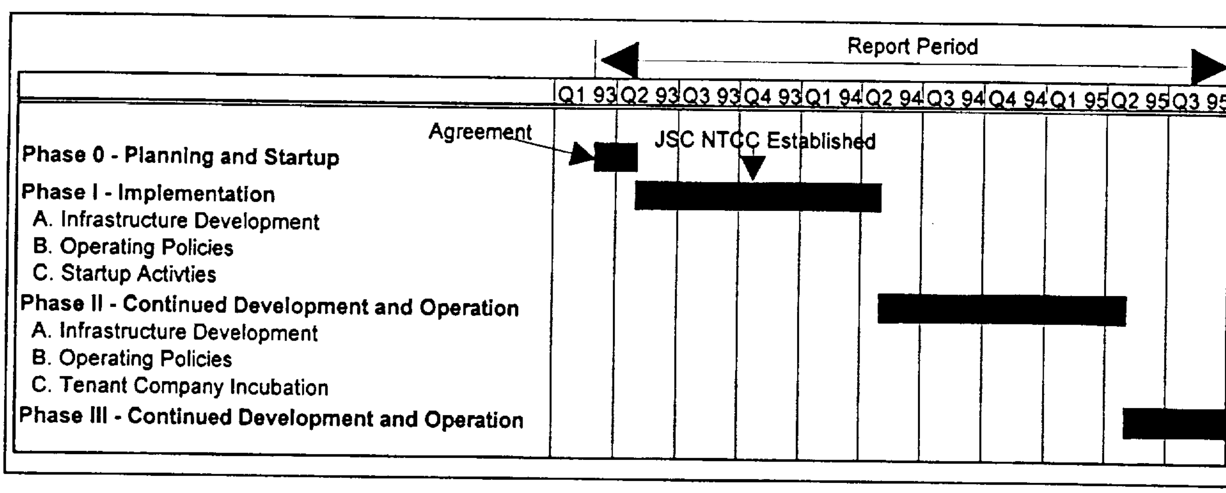


Figure 1. Report Time Period

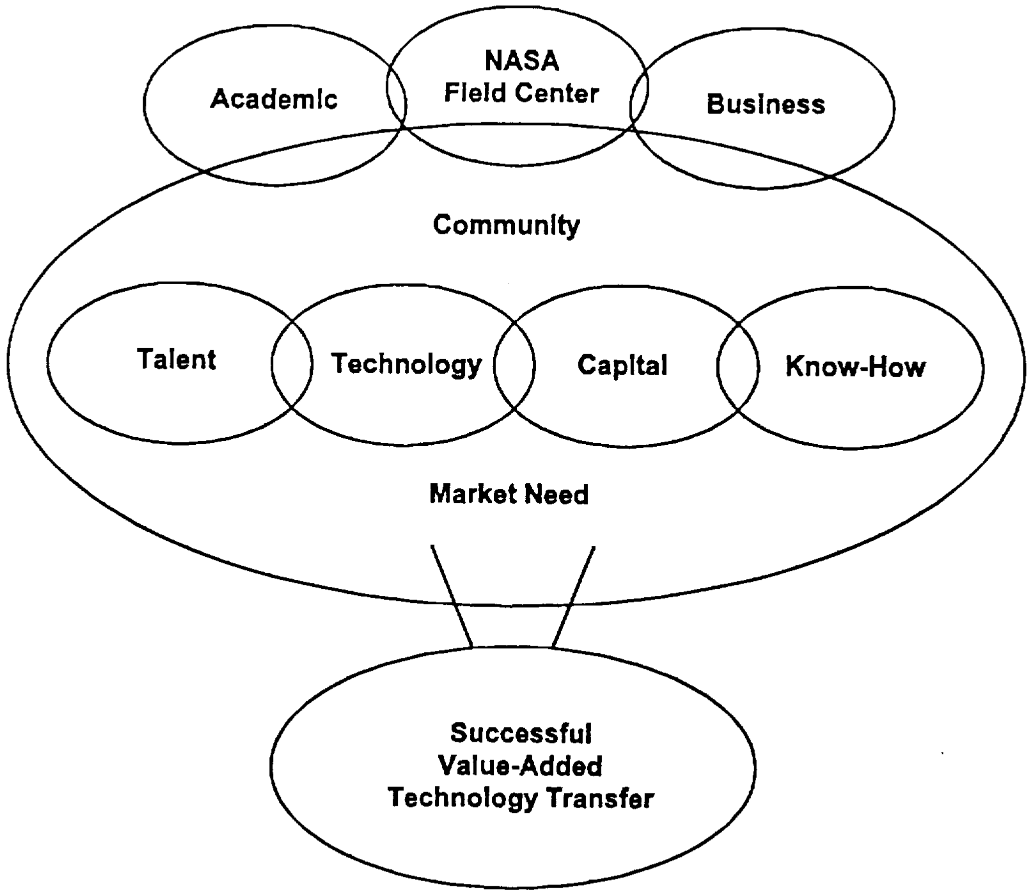


Figure 2. NASA TCC Model

The simplified NASA Technology Commercialization Center model illustrated in Figure 2 is described in detail in the original proposal:

> *The primary drivers are entrepreneurs/champions - people who make things happen - and NASA technologies or ideas that have a real potential to be commercialized within a reasonable period of time. Center management will develop and maintain a support system that provides access to quality capital, extended know-how networks, and cost-effective facilities. Each center will function to shorten the learning curve of tenant companies while broadening the entrepreneurs' know-how in business, market research, finance, distribution, sales and service, and management. Metrics for success will include product/process commercialization, regional and national economic development, job creation, profit, the graduation of viable companies, and enhanced U.S. industrial competitiveness.*

The premise of this report is that the effectiveness of the TCC model as implemented at JSC can be determined by objective measurement and analysis of the inputs and outputs, treating the process as a "black box". The process itself is described separately in the JTCC Operations & Procedures Manual.

1. Data

1.1 Technologies

Technology can be measured in four dimensions: quantity, quality, diversity and timing. Quality is the benefit of the technology relative to state of the art, the size and scope of the market opportunity, and the stage of development. Quantity is simply the number of technologies available for commercialization, diversity is the availability of a wide range of different types of technology, and timing is the flow of technologies over time. A steady flow of a significant number of diverse, high quality technologies is desirable.

Quantity

Approximately 120 technologies were identified and catalogued during the course of the project. Figure 3 provides the original identification date by NTCC staff (Austin or JTCC) for each JSC technology by quarter.

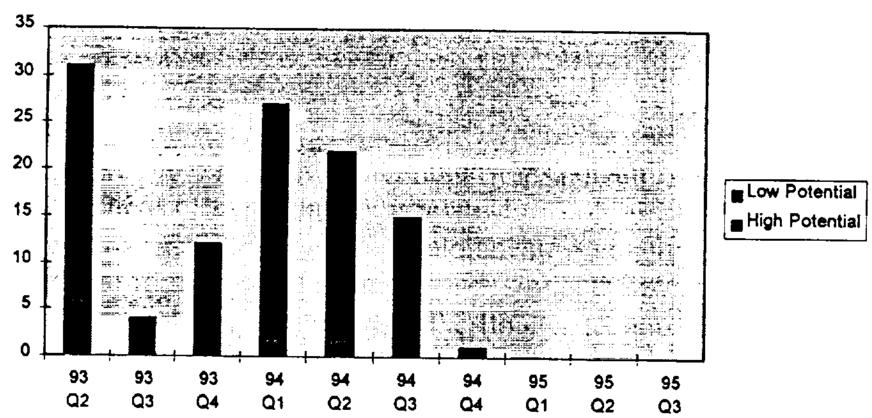


Figure 3. JSC Technology Identification by Quarter

Quality

Analyses were conducted to determine the commercial potential (i.e. "quality") for each sufficiently documented JSC technology. As mentioned above, the commercial potential is a function of the strength of the technology (the benefits of an embodiment of a new technology relative to the state of the art) and the magnitude of the market opportunity (value of the technology to potential users; market size and growth, industry structure and other factors). In addition, technologies at a later stage of development have lower technical and market risk associated with them (i.e. it is less likely that the market will change or that a better technology will emerge) compared to early stage technologies. Thus, each technology is ranked ac-

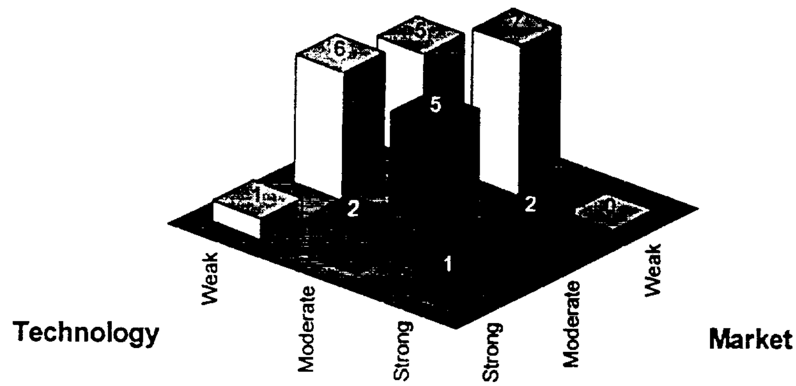
cording to these three criteria. In order to facilitate analysis of the portfolio of technologies, each criterion contains three classifications, as described in Table 1:

Table 1: Technology Classification Descriptions

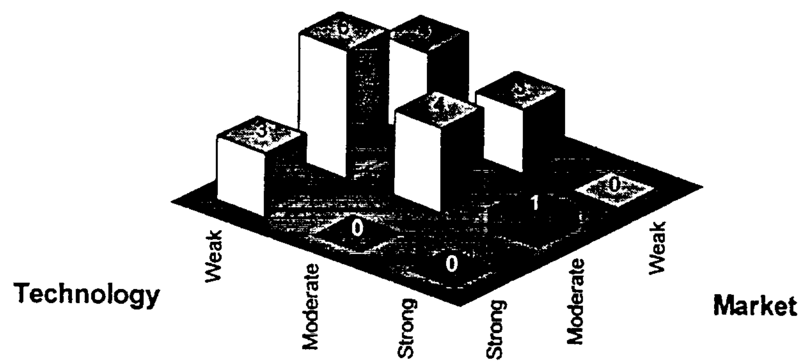
Criterion	Classification	Typical Technology
Technology	Weak	A "me too" technology, or a technology which merely increases knowledge. There are usually no intellectual property rights, or the IPR are limited to a non-commercial application
	Moderate	An incremental innovation which improves the state of the art, or a possible (but unconfirmed) breakthrough
	Strong	A confirmed breakthrough (a.k.a. radical innovation)
Market	Weak	A very limited niche market, or one which places no value on the benefits of the technology
	Moderate	A niche market which values the benefits of the technology but may have significant barriers to entry
	Strong	A significant broad market which highly values the benefits of the technology and has low barriers to entry
Stage	Early	A technology which exists only on paper, with perhaps limited proof of concept testing
	Mid	Working prototype or final product for an application which is significantly different from the intended commercial market application
	Late	Working prototype or final product, for the intended commercial market application

Figure 4 illustrates the decision matrix developed to capture the relative opportunities for the portfolio of technologies. Each technology is mapped to the appropriate sector of the matrix, and technologies falling in the shaded sectors of the matrix are generally perceived as having the greatest commercial potential. Note that the shaded sectors vary according to the development stage. Late-stage technologies generally require lower capital investment for commercialization, and therefore represent a lower risk for the transferee. Therefore a broader section of late-stage technologies are identified as commercially viable (grey-shaded segments) than mid- or early-stage technologies. The individual technologies summarized in Figure 4 are listed in Appendix A. JSC Market & Technology Grid Detail.

Late Stage Technologies



Mid Stage Technologies



Early Stage Technologies

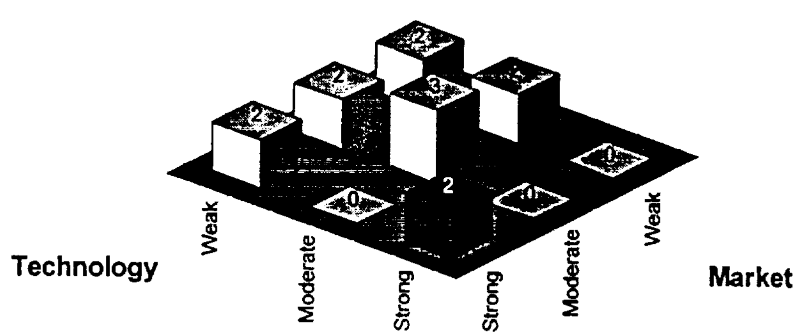


Figure 4. Technology & Market Rankings of JSC Technologies

Diversity

JSC technologies identified fall into categories as shown in Figure 5. The largest single category is life science, followed by software and mechanical devices.

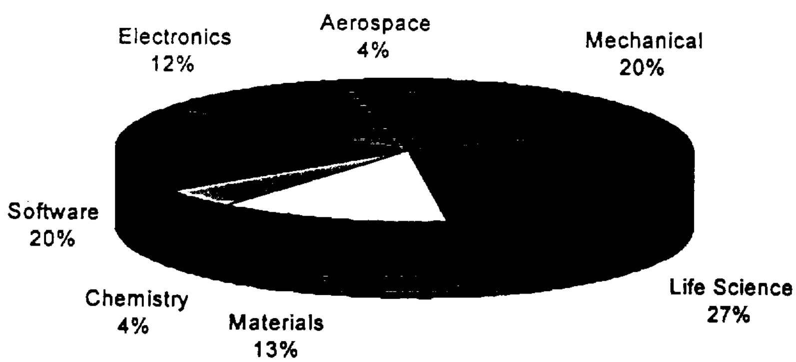


Figure 5. JSC Technologies by Category

1.2 Regional Entrepreneurs/Economic Development Champions

There is no objective measure for the entrepreneur/champion input, although there is subjective consensus that the Clear Lake area has a dearth of high caliber entrepreneurs. This is reflected in the small flow of business plans coming into the TCC for review, and in the JTCC know-how network, which includes few true entrepreneurs in its membership. NASA's importance in the regional economy has nurtured a contractor mentality, characterized by high risk aversion and a dependence on government funding.

The situation at JSC is in contrast to Ames, where the TCC has successfully tapped into the entrepreneurial base of Silicon Valley. In economic development terms, Clear Lake is in the earliest stage, whereas Silicon Valley has experienced take-off, not once but twice.

1.3 External Factors

The JTCC exerts little influence over the time required to process a transfer request once it has been made, since the transfer approval process resides within the NASA system. Therefore the time required to process licenses is considered to be a factor external to the experiment. Figure 6 shows the time required to process successful transfers[1]. The length is defined as the amount of time between the official request for a technology (eg., license application, SBIR application) and the official issuance of documentation granting the request.

[1] See page 11 for a description of the transfer types

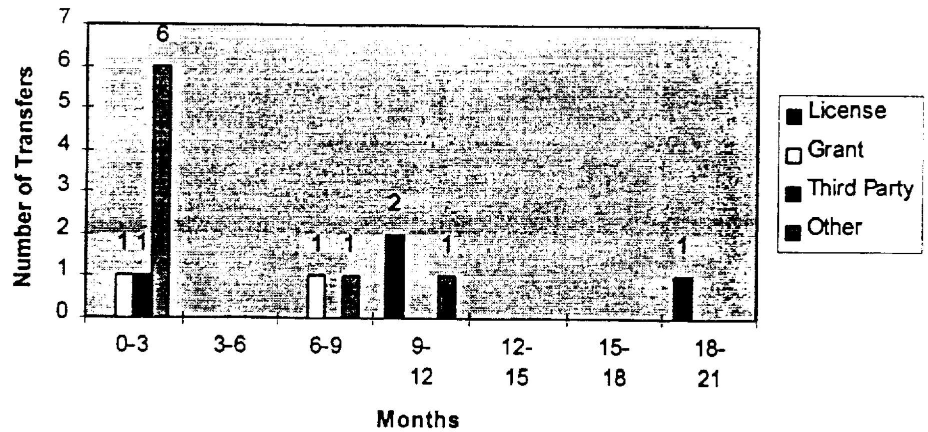


Figure 6. Transfer Process Length

1.4 Results

Figure 7 shows the number of completed technology transfers (licenses and technical exchange agreements) over time. (See Appendix B. Completed and Pending Transfers, for a list of the technologies which make up this metric.)

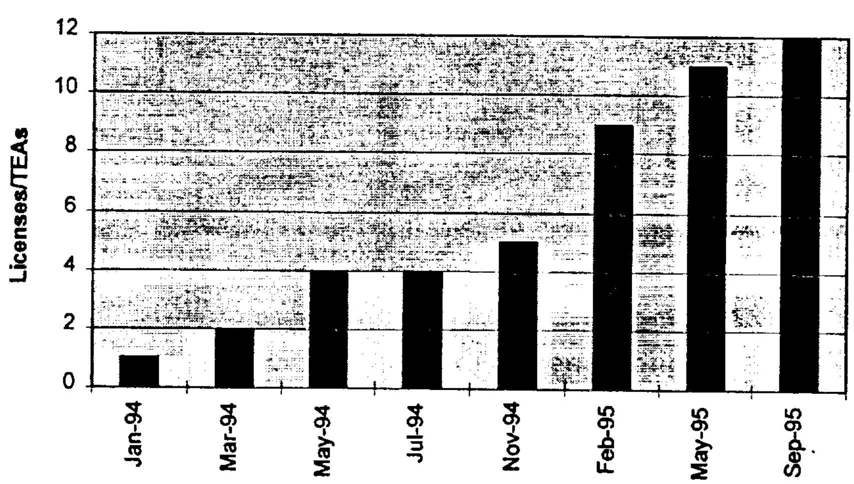


Figure 7. Completed JTCC Transfers by Period

Figure 8 provides a breakdown of completed transfers by agreement type: license, grant, third party, or other. License refers to a license issued by NASA for use of a NASA-owned patent. Grant refers to a NASA-funded SBIR involving a NASA technology. Third party

refers to agreements where intellectual property rights are owned by a third party (eg., university or NASA contractor), but NASA has played a substantial role in co-developing or furthering the development of the technology. Other agreements include NASA Space Act Agreements, Software Waivers, Memoranda of Understanding, Cooperative Agreements, and other non-fee paying and non royalty-bearing agreements.

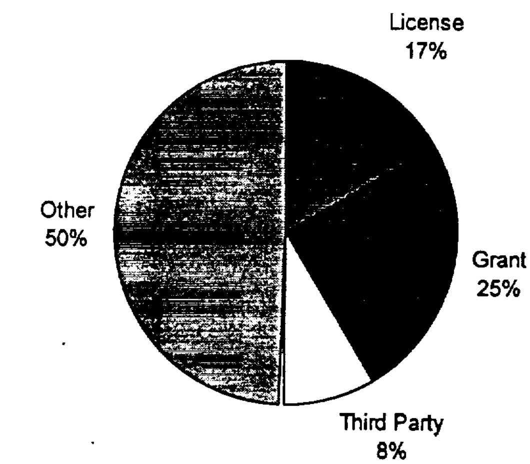


Figure 8. Transfers by Agreement Type

The transfer outcomes of all identified JSC technologies are illustrated in Figure 9. Figure 10 displays the transfer outcomes for the sub-group of high potential JSC technologies referenced in Figure 4.

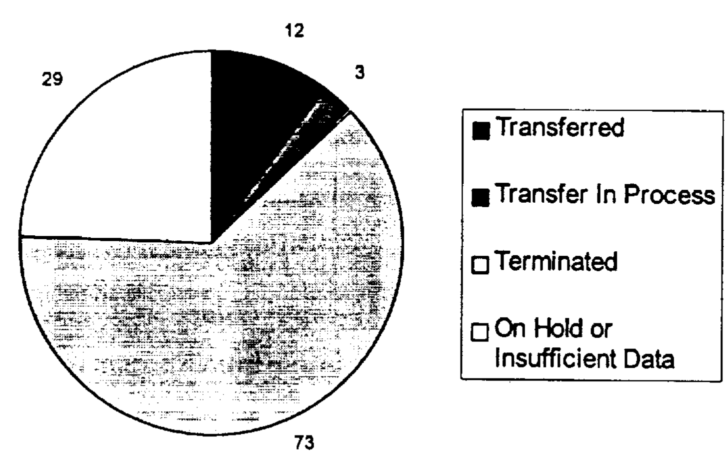


Figure 9. Transfer Outcome of All JSC Technologies

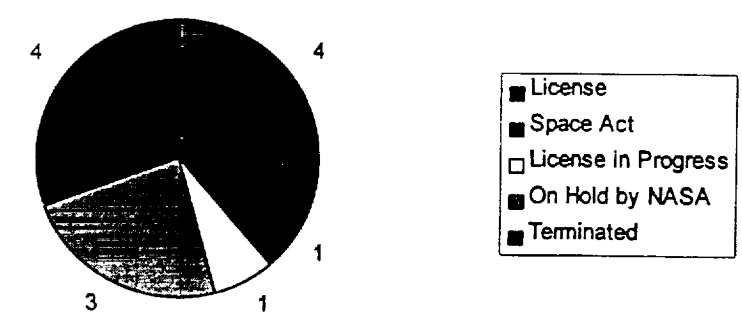


Figure 10. Outcome of High Potential JSC Technologies

Figure 11 shows the number of TCC companies, including tenants, without walls companies, and graduates, where tenants are defined as companies renting space within the TCC building; "without walls" companies utilize the TCC's services but are not physically located within the building; and graduates have left the TCC to operate as stand-alone entities. The two and three year proposal target metrics are shown for reference.

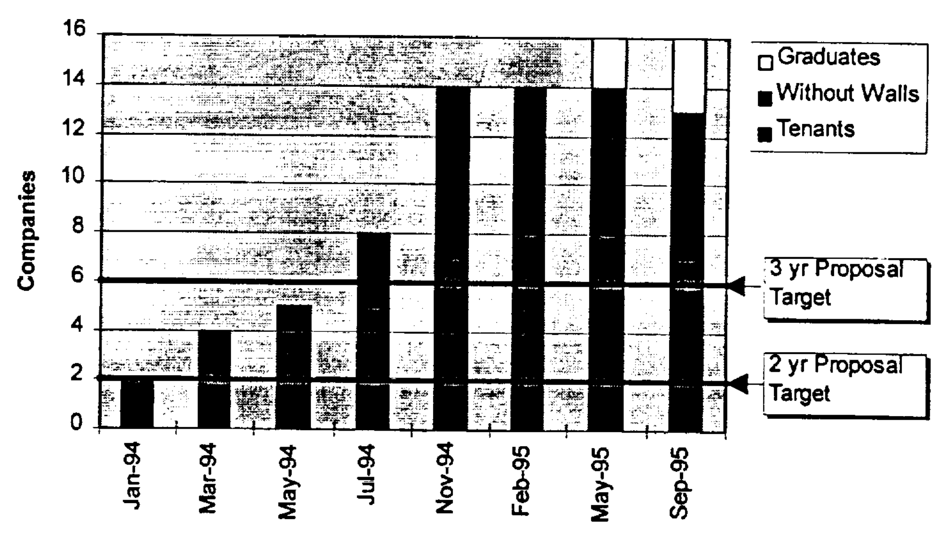


Figure 11. Companies Nurtured by JTCC

Figure 12 shows the number of jobs created by TCC companies, also broken down by tenant, without walls and graduate companies.

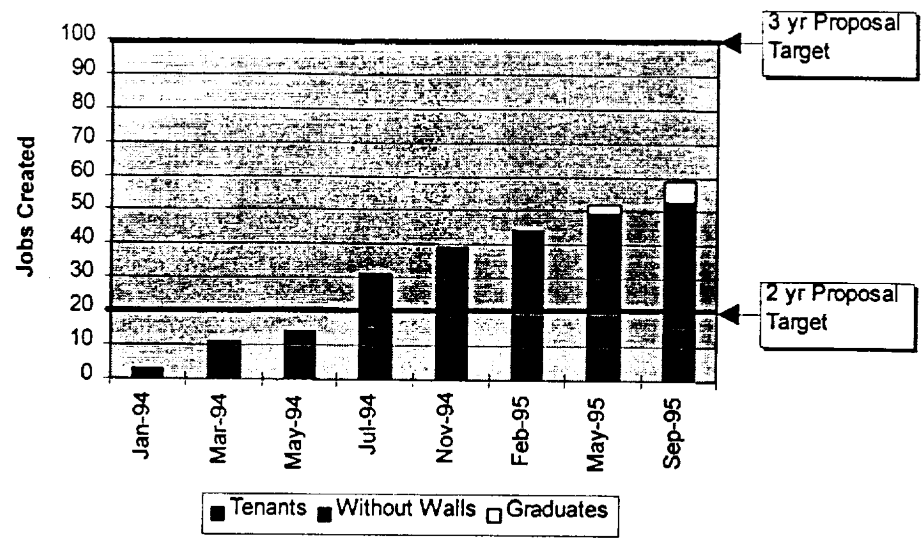


Figure 12. Jobs Created

Figure 13 shows total funding raised over time by tenants only. Figure 14, which summarizes the detailed financing metrics shown in Appendix D. JTCC Company Financing includes without walls and graduated companies, and is broken down by funding type. "Personal investment" includes the entrepreneur's personal savings invested, "in kind", etc.; "Outside equity" includes venture capital, corporate partnerships, private investors, etc.; "Government funds" includes SBIRs; and "Working capital" includes sales, contracts, "customer financing", etc.

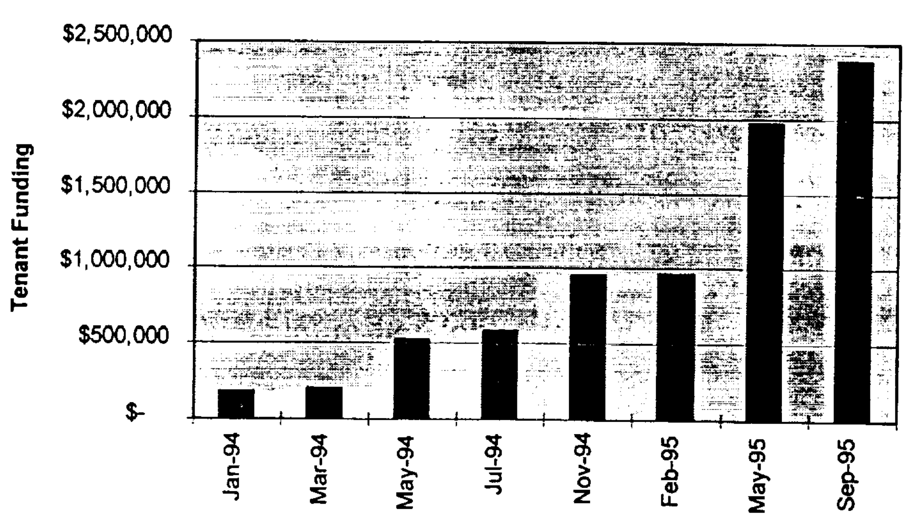


Figure 13. Funding Obtained by JTCC Tenant Firms

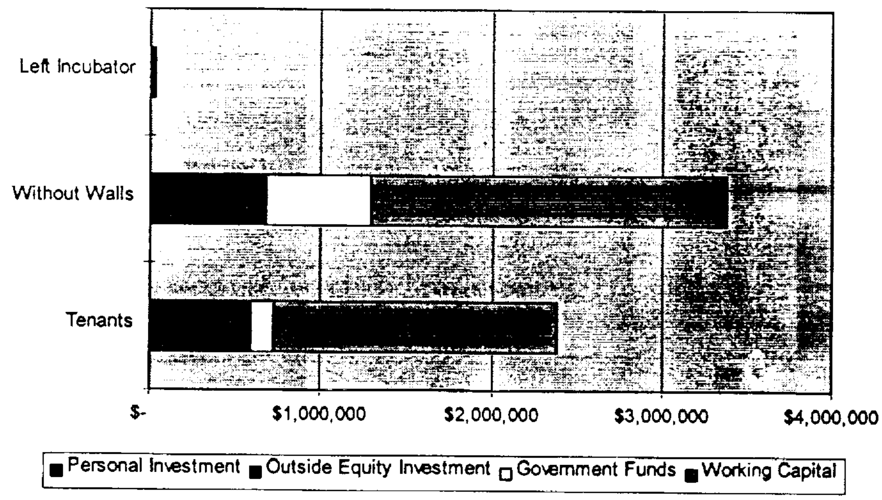


Figure 14. Current Funding of Tenant, Without Walls and Graduate Companies

The original IC^2 proposal cited knowledge transfer as an objective of the project. Specifically, this goal was to involve leveraging the JTCC's resources with universities and colleges in the region, providing interested NASA personnel and NTCC tenant firm personnel with training programs for successful development of technology-based firms as well as commercialization of NASA-derived science and technology. Figure 15 provides specific metrics for this objective in terms of cumulative seminars conducted and number of attendees.

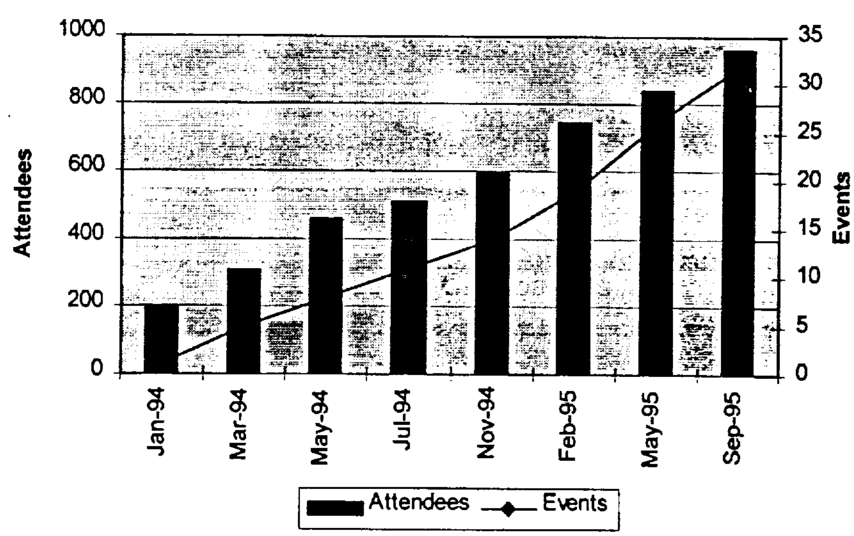


Figure 15. NTCC Seminars and Attendance

Figure 16 shows the number of graduate interns who have held internships at the JTCC and in Austin during the project. (Austin interns worked on both the JTCC and the Ames TCC.) These interns have moved on into a number of business fields. Three Austin interns formed companies to commercialize JSC technologies after completing their internships.

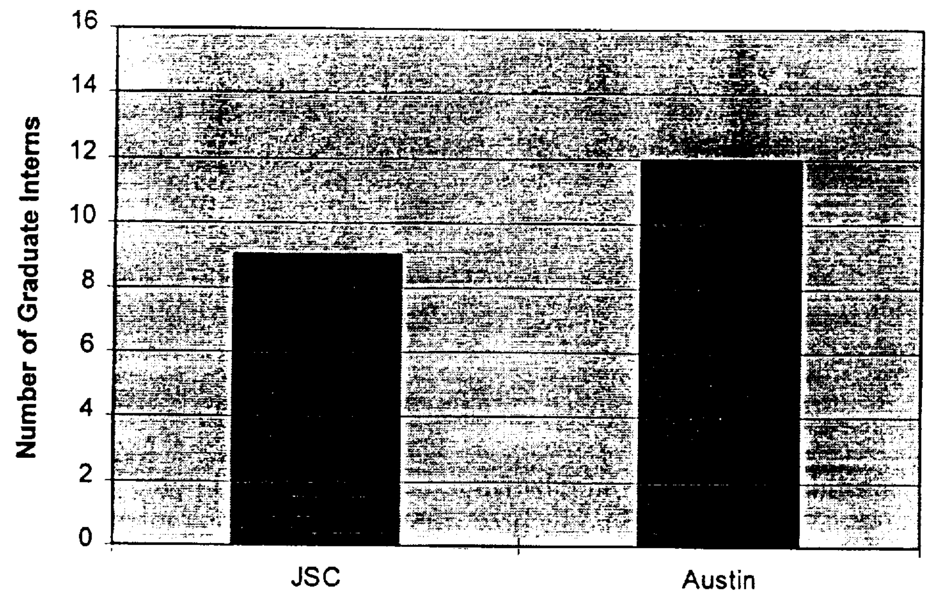


Figure 16. JTCC Graduate Internships

2. Discussion

Do what you can, with what you've got, where you are

Franklin D. Roosevelt

2.1 Targets & Metrics

Table 1 compares specific targets for the JTCC defined in the original proposal with metrics achieved by the close of the experiment.

	2 Yr Target	3 Yr Target	2.5 Yr Actual
Incremental increase in licenses and royalties	5%	10%	Not measured[2]
Tenant firms	2	6	7
Know-how network participants	200	1000	700
New jobs	6 - 20	100+	58
Graduate student interns	8	12	15[3]
Entrepreneurial courses	2	6	See footnote[4]
Workshops/conferences	4	12	See footnote[3]

Table 2. Results compared to targets

With the exception of royalties, which cannot be meaningfully measured at this time, the experiment has met or exceeded all two year targets. The program is on track to meet three year targets (which will come into effect in March 1996, 3 years after contract award) in all categories except new jobs. Other relevant metrics developed in the course of the experiment and reported in Section 2 (e.g. tenant financing) have also exceeded expectations.

2.2 Key Observations

Analysis of the data presented in the Section 2 leads to a number of observations:

1. Figure 3 tells an interesting story about the technology identification process at JSC. The most plausible interpretation of the data is as follows:
    - The initial inventory conducted by project management staff and Austin interns in the first months of the program launches the identification process, and includes a

[2] 4 licenses have been completed, but the reference number of existing licenses is unknown; also, it is too early for any of these licenses to have generated significant royalties. This information may be tracked by NASA internally.
[3] 9 based at the JTCC, plus six more based in Austin and allocated fully to JSC
[4] 32 total events attended by more than 900 individuals included entrepreneurial courses, workshops, conferences and other activities directed toward expanding the entrepreneurial base of the Clear Lake area, such as monthly CEO luncheons.

higher proportion of high potential technologies than later in the program, perhaps because these had naturally come to the attention of JSC management.

- Technology identification drops off significantly in the second and third quarters as the focus is moved to Center start-up activities, and commercialization work is initiated on the initial inventory. This is also prior to hiring the full-time marketing staff.
- After a spurt of activity at the end of the first year (which consisted primarily of pre-existing patents), technology identification tailed off to zero by the end of the second year. In a model driven by technologies (unlike Ames, which has a sufficient pool of entrepreneur/champion drivers who can be linked to technologies as appropriate), this tail-off in technologies (especially high potential technologies) is disturbing. It may be a consequence of several factors, including internalization of the technology identification process and allocation of technologies to different tech transfer groups (RTI, MCTTC) by JSC, failure by the TCC to look for new technologies using non-traditional techniques[5] (e.g. networking with scientists), or more disturbingly it may indicate JSC has no more commercializable technology, either on the shelf or in the pipeline.

2. Figure 5 supports the notion that JSC technologies cover the breadth of the technological spectrum. Quality is also dispersed among the categories: of the fourteen high potential technologies, six are life science, four software, three mechanical, and one electronics. However, it is significant that all current JTCC tenant companies are in the software field. There are several possible reasons for this:

    - Software start-ups usually require lower capitalization than others.
    - Software development is often viable for a small business while other technologies may require access to significant complementary assets.
    - Most software technologies are not patented and therefore not licensable, and a software waiver or Space Act agreement is faster and carries no up front fee or royalty payment. The transfer requires little commitment from the transferee.

3. Approximately 20% of technologies identified and assessed at JSC are determined to have commercial potential (Figure 4). This percentage is closer to 10% when non-assessed technologies are included (few technologies in the non-assessed category are expected to have commercial potential, since most were dropped based on the technology assessment alone.)

4. More transfers have been made or are in process from JSC than there are high potential technologies. (Several transferred technologies, including Splicer, Telrip, O2Code and MORE, were partnered with transferees before a market assessment was conducted, and a market assessment was not subsequently requested. These technologies are therefore not included in the rankings. Also, some transfers have been made or are in process for tech-

[5] Incentive issues may have contributed here. Although licensing was a clearly defined metric for the JTCC, other metrics were more immediate and outwardly visible. The emphasis of the on-site JTCC staff was therefore on incubator activities, especially identification and recruitment of entrepreneurs and start-ups to occupy the office space.

nologies just outside the border of high potential, such as ICAT.) This indicates that the TCC process has been effective in facilitating transfers of high potential technologies.

5. Figure 6 indicates that a license application is never processed in less than nine months, while a space act agreement can usually be executed quickly if the researcher is cooperative. The license processing time is disturbing in today's business and technological environment, in which a competitor is rarely more than a few months behind the market leader. Technology becomes quickly outdated, especially if it is tied up in an administrative process and is not being actively developed.

6. Figure 8 illustrates that licensing is not the dominant transfer mechanism, and only a few of the licenses are or will be royalty bearing. As a result, NASA frequently does not benefit financially from the transfer. Most transfers (75%) are to start-ups, and even the transfers to existing companies are to small companies.

7. While the amount of funding raised by companies associated with the JTCC is impressive, the majority has been from personal investment, sales or in some cases SBIR grants. Few have successfully raised outside equity investment.

8. Year 3 job creation must be assessed in the context of space and resource constraints. The original proposal had anticipated expansion of the TCC in step with space requirements for new tenants and growing established tenants. However, when the original TCC space became filled, funding was not available for expansion. The strategic direction of the TCC was consequently adjusted to increase the focus on "without walls" companies. Including both tenant and "without walls" companies, job creation is on track to meet year 3 targets.

9. The Ames TCC has been significantly more successful in terms of the number and diversity of tenant firms, jobs generated, and funding raised, but has generated fewer official technology transfers to date. This raises some interesting hypotheses about the merits of the different models and the long-term viability of each Center[6]:

    - In an entrepreneurial community such as Silicon Valley, an entrepreneur-driven model is more effective than a technology-driven model, especially where the availability of ground-breaking technologies is questionable or access to these technologies is limited.

    - A program which is successful in terms of economic development (jobs, new businesses, knowledge transfer) may not reward NASA with significant tangible license agreements or royalty streams. (If this hypothesis is valid, this would support the notion discussed below that the funding base for the TCCs should be di-

[6] Subjective information is necessary to validate or reject each of these hypotheses. This report is based on objective data only, and no attempt is made to assess these hypotheses. Such hypothesis testing is more appropriate for individual stakeholders to attempt in full and frank discussion with each other.

versified to include other current or prospective beneficiaries, including community and local business organizations, and other sources of technology)

2.3 Conclusions

Although the purpose of this report is primarily to present data, several conclusions which impact the ongoing structure and operation of the JTCC are also proposed:

- The Clear Lake community does not contain the critical mass of entrepreneurial talent necessary for long term viability of the JTCC. The Center must either seek to expand beyond Clear Lake into the Houston business community, or devise means to attract entrepreneurs to the area.
- The JTCC has not demonstrated an ability to provide a financial return to JSC or NASA through royalty-bearing licenses. IC^2 believes this is primarily because of a lack of technologies with strong commercial potential[7]. However, regardless of cause, the JTCC must seek to diversify its funding beyond NASA if the program is to remain financially viable.
- The lack of strong commercial technology at JSC is another direct reason for diversification. The JTCC will not be nurturing sufficient viable businesses if it continues to be tied to JSC technologies.

[7] This assertion must be qualified: IC^2 has not been shown any new technologies for at least the last year of the experiment, and no new JSC technologies have been linked with JTCC tenant companies, leading to the conclusion that JSC's technology inventory has been exhausted and is not being replenished by a strong invention flow.

Appendix A. JSC Market & Technology Grid Detail

Late Stage

Mkt Opptnty ↓	Technology Assessment: Weak	Technology Assessment: Moderate	Technology Assessment: Strong
Strong	• Textile Fibers	• Neutral Posture Chair • Plant Air Purifier	• Zeoponic Soil
Moderate	• Shelf Stable Tortillas • Electronic Still Camera • Sharps Container • Modal Test Technology • FIRM • Adult Literacy Tutor	• Magnetic Check Valve • FEAT, ERF • Rotating Bioreactor • Time Domain Reflecto-meter • Force-Torque Sensor	• Shock Absorber • Physics Tutor
Weak	• Attachment Device • Inflatable Rescue Device • Chemical Stripper for Anodized Aluminum • High Temp Composites • Ablative Shield	• Magnetic End Effector • TRAC/AUTOTRAC • APEX • Quick Connect Fasteners • Robot-Friendly Connector • Joint Preload Mechanism • Gimbal Joint	

Mid Stage

Mkt Opptnty ↓	Technology Assessment: Weak	Technology Assessment: Moderate	Technology Assessment: Strong
Strong	• Multi-Phase Flowmeter • Scopalomine Nose Drops • NELS		
Moderate	• Hyperman • Ice Detection System • Pattern Recognition • VIVED • Computer Mouse • VR Data Gloves	• Water Treatment System • Dried Blood Chemistry • Blood Volume Measure-ment Device • ICAT	• CONFIG
Weak	• O2 from Lunar Materials • Trash Removal System • Treadmill in Space • Miniaturized Mossbauer Sensor	• Surface Modification • Neutral Buoyancy Portable Life Support System • Kinetic Tetrazolium Mi-crotiter Assay	

Early Stage

Mkt Opptnty ↓	Technology Assessment: Weak	Technology Assessment: Moderate	Technology Assessment: Strong
Strong	• GPS Real-Time Attitude Determination • Ceramic Matrix Composite		• Heart Catheter • Heart Pump
Moderate	• Advanced Fullerene Alloys • Solar Photovoltaic Heat Pump	• Cooled Spool Compressor • Microwave Sterilizable Access Port • VR for Head Injury Reha-bilitation	
Weak	• Measurement of Urok-inase • Tetrahedral Lander	• Microgravity Encapsula-tion of Drugs • Real-time Electrochemical Urea Analysis	

Appendix B. Completed and Pending Transfers

Status	Technology	Firm Type	Transfer Mechanism	Agreement Category[8]
Transferred	Telrip	E	SBIR	Grant
	MORE	E	Coop Agrmt	Other
	DARIS	E	SBIR	Grant
	Splicer	S	Cosmic	Other
	Physics Tutor	S	License	License
	O2Code	S	MOU	Other
	FEAT, ERF, AMDA, Digraph Assembler[9]	S	SAA	Other
	Zeoponics	S	License	License
	Neutral Posture Chair	S	Non-NASA	Third Party
	Video Abstraction	S	SBIR	Grant
	REAP	S	SAA	Other
	Cost Modeler	S	SAA	Other
Pending	ICAT	E	License	License
	Enigma	E	Waiver	Third Party
	CLIPS	E	SAA?	Other

Key:

Firm Type	E = Established Firm, S = Start-up venture
SBIR	Small Business Innovation Research grant (Phase I or II)
MOU	Memorandum of understanding
Non-NASA	Intellectual property owned by entity other than NASA (e.g. contractor)
SAA	Space Act Agreement
Waiver	Software waiver
COSMIC	Publicly available on the COSMIC database

[8] Agreement Category as listed in Figure 8. Transfers by Agreement Type on page 11

[9] These four software technologies are closely inter-related, and are therefore considered a single transfer

Appendix C. JTCC Company Status

AdvanTex, Incorporated

Provides software analysis and control products based on NASA developed software by embedding advanced computing technologies into application programs and tools. These advanced technologies include genetic algorithms, simulated annealing, fuzzy logic and neural networks. Has developed SPLICER-PC, POLYFIT, and MICRO-X for market.

Principals: Jack Adlridge, Ph.D.
Market: Universities, engineering, scientific, and government agencies
Technology: JSC SPLICER genetic algorithm
Financing: Does not need financing at this time, received $39,000 subcontract from A&M University from a contract from Center for Space Power to develop a controller.

First Contact	Oct. 93	NASA Connection	JSC software from COSMIC
In Incubator	Jan. 94	Management Team	Founder/Scientist (CTO)
Business Plan	Dec. 93	Product Status	Debugging/Develop Interface
First Customer	3 Q 95	Current Financing	$57,000 (contracts, self)
		Financing Sought	
		Current Jobs	1

Aphelion - Robotics, Inc.

Has a business plan to manufacture and market end effectors and components using NASA patented technology. This plan is now being revised to combine his software business into it. The software business is five years old and includes a Health Club management package and a monthly catalog of components for the petro chemical industry.

Principals: Reg Berka, Ph.D.
Market: Robotics industry, point-of-sale businesses.
Technology: JSC patented technology which involves development of magnetic tool changeout and multi sensor end effectors as well as data compression developed at NASA Goddard.
Financing: Self-financing start-up.

First Contact	Sept. 94	NASA Connection	JSC-Space Act Agreement in Development
In Incubator	Dec. 94	Management Team	Founder/Scientist (CEO)
Business Plan	Jan. 95	Product Status	In development
First Customer	4 Q 91	Current Financing	$825,000
		Financing Sought	TBD
		Current Jobs	11

Applied Information Sciences (Provisional)

Product is the Internet searching tool derived from automatic classification algorithms and visual searching algorithms. the tool gives the user specific custom lists of URL's that apply to his needs. Currently, AIS is applying for a license for Dr. Rorvig's own patent on pattern recognition.

Principal:	Mark E. Rorvig, Ph.D.
Market:	All Internet users
Technology:	JSC pattern recognition software algorithm (Patented)
Financing:	Seeking $700,000 from venture community.

First Contact	Apr. 95	NASA Connection	JSC Patent license
In Incubator	May. 95	Management Team	Founder/Scientist
Business Plan	Jun. 95	Product Status	Prototype
First Customer	Dec. 95	Current Financing	$10,000
		Financing Sought	$500,000 to $700,000
		Current Jobs	2

Hazard Analytics International, Incorporated (HAI)

Process Safety Management Analysis Software, and Hazardous Operations (HAZOP) analysis software. Developed Logix Diagnostic Expert (LDE) to perform HAZOP analyses.

Principals:	JT Edge, Thomas J. Zakrzewski
Market:	Manufacturing, petrochemical processing, environmental control, telecommunications, aerospace, power generation and distribution, and governmental agencies.
Technology:	JSC Failure Environmental Analysis Tool (FEAT), Extended Real Time FEAT (ERF), Augmented Monitoring and Augmented Diagnostic Monitoring Application (AMDA), Digraph Assembler (DA), and SourceDoubls Reachability Algorithm ("I" Algorithm).
Financing:	Seeking corporate partner.

First Contact	Oct. 93	NASA Connection	JSC Space Act Agreement, ARC license submitted
In Incubator	Jan. 94	Management Team	Founder/Scientist (CTO)
Business Plan	Dec. 93	Product Status	Software at B stage
First Customer	4 Q 95	Current Financing	$90,000 (in kind)
		Financing Sought	$300,000
		Current Jobs	1

Jack Rabbit Productions - Metrica, Incorporated (Provisional)

Developing computer-based education products and services that are: interactive and real-time, multi-participate capable, network deliverable, network and platform independent, and multi-media based. This is a strategic partnership between Metrica and Modulus. Metrica has just taken on the lead role in the development of the technology. Financial needs will be determined upon finalization of the business plan.

Principals: Phyllis Thompson
Market: Internet, value-added resalers, software houses, and arcades.
Technology: TELRIP (renamed INTERAGENT)and DARIS software developed jointly with Modulus.
Financing: TBD

First Contact	Aug. 94	NASA Connection	NASA software:
In Incubator	May. 95	Management Team	COO
Business Plan	Jul. 95	Product Status	Relationships in place
First Customer	4Q 95	Current Financing	$400,000 (in kind)
		Financing Sought	$2,000,000
		Current Jobs	2

The Laser Professor of Clear Lake, Inc.

Develops and markets interactive multimedia instructional courseware.

Principals: Joseph Marcinkowski
Market: Educational institutions and companies, general public.
Technology: JSC ICAT (Interactive Computer Aided Training) and Physics Tutor.
Financing: Seeking $300,000 for growth.

First Contact	Oct. 93	NASA Connection	Physics Tutor license
In Incubator	Jan. 94	Management Team	CEO, CTO
Business Plan	Dec. 93	Product Status	Develop user interface
First Customer	1 Q 96	Current Financing	$570,000 (Sales)
		Financing Sought	$300,000
		Current Jobs	3

The Tenagra Corporation

Has a NASA Phase I SBIR to develop "Automatic Video Abstraction" that will automatically obtain a short abstract of lengthy color video motion pictures. Other products include custom software development, low cost control center software applications and advanced scheduling tools that optimize resource utilization. Tenagra also helps organizations establish presence on the Internet.

Principals: Clifford Kurtzman, Ph.D., Trung Pham, Ph.D.
Market: Government, industries, offices, companies, those interested in Internet services.
Technology: JSC Intelligent Filter for Visual Documents (Data Visual Abstraction)
Financing: Not looking for financing at this time.

First Contact	Oct. 93	NASA Connection	NASA SBIR
In Incubator	Jan. 94	Management Team	CEO, SEC/TREAS
Business Plan	Dec. 93	Product Status	In development
First Customer	4 Q 95	Current Financing	$379,000
		Financing Sought	none
		Current Jobs	6

The Valley Tech Corporation

Has Phase 1 SBIR from Brooks AFB for ultrasonic cardiac output monitors and a MOU with Rice Univ for developing Wavelet based noise reduction technology. Internet Division provides international Internet connect services to the Rio Grande Valley with future expansion services implementing signal processing technology.

Principals:	Dr. Robert Feldtman
Market:	General public, educational institutions
Technology:	JSC Wavelet technology and NASA Goddard developed data compression.
Financing:	Does not need financing at this time.

First Contact	Feb. 94	NASA Connection	NASA SBIR's submitted
In Incubator	Apr. 94	Management Team	CEO, COO
Business Plan	July 94	Product Status	In development
First Customer	1 Q 95	Current Financing	$360,000
		Financing Sought	None at this time
		Current Jobs	5

Without Walls Companies

Information Clearinghouse, Inc.

Transfers scientific and engineering data from govt to commercial sector via Internet or CD-ROM products.

Principals:	James Anderson
Market:	Scientific and engineering
Technology:	NASA Flight Data
Financing:	Seeking partner.

First Contact	Aug. 94	NASA Connection	Space Act Agreement
In Incubator		Management Team	CEO, CTO
Business Plan	Jun 95	Product Status	User interface required
First Customer	2 Q 95	Current Financing	$10,000
		Financing Sought	$100,000
		Current Jobs	2

Kingwood Systems, Incorporated (KSI)

Product is a MRP II software system for use in a discrete manufacturing company or in a job shop make-to-order environment. The CASE Tool language used provides KSI with the ability to develop high quality programs and tools to quickly change the code to the customer's specification. The inclusion of source code with the system is unique in the software industry. The Kingwood Manufacturing System (KMS) was generated using the Informix Relational Data Base Manager and Fourgen Case Tools. This is an important feature because it means that all of the programs conform to a single standard using a Relational Data Base.

Principals:	Marshall Isaacson, Randall Johnson, Michael Loup
Market:	Job shops who make-to order and discrete manufacturers.
Technology:	JSC Space Act Agreement
Financing:	Seeking $500,000 from venture community.

First Contact	Jan. 94	NASA Connection	JSC Space Act Agreement in development
In Incubator	Aug. 94	Management Team	CEO, CTO, COO
Business Plan	Sept. 94	Product Status	Complete
First Customer	Oct. 94	Current Financing	$1,462,000
		Financing Sought	$500,000
		Current Jobs	6

Modulus Technologies, Inc.

Provides middleware and middleware-based network applications for distributed computing.

Principals: Rex Shelby
Market: Banking and securities industries.
Technology: JSC TELRIP (renamed INTERAGENT) and DARIS
Financing: Just completed strategic partnership alliance for marketing. (40 reps US, 20 reps abroad). This alliance is expected to bring revenues to Modulus of aproximately $2,000,000 in 1996.

First Contact	Dec. 93	NASA Connection	NASA software: TELRIP and DARIS
In Incubator	Apr. 94	Management Team	CEO/Mkt., CTO, VPOP
Business Plan	Mar. 94	Product Status	Sales
First Customer	Sept. 94	Current Financing	$750,000
		Financing Sought	none
		Current Jobs	7

Ortech Engineering Inc.

Ortech has just completed the transfer of a NASA Phase II SBIR to develop a fuzzy logic based environmental controller for a test bed that will simulate space station, commercial, and residential environments. The test bed is a 14 x 80 mobile home with a system to perform experiments and analysis on zone control, fan and compressor control, environment sensing, and occupancy activity sensing. Ortech is presently marketing 11 hardware products and 13 accessory products and they distribute 20 products for other manufacturers. These are sold into the industrial control market.

Principals: Edgar Dohmann
Market: Commercial builders and private homes.
Technology: Develops intelligent environmental controls employing fuzzy logic and modeling which will result in improved heating, ventilation and air condition controllers.
Financing: None required at this time.

First Contact	Sept. 94	NASA Connection	NASA SBIR
In Incubator	Nov. 94	Management Team	CEO, VP, R&D
Business Plan	Dec. 94	Product Status	In development
First Customer	4 Q 95	Current Financing	$1,028,000 (govt, sales)
		Financing Sought	none
		Current Jobs	7

ReSoft, Inc.

Specializes in software reengineering methodology and tool development and training. The technology employs: gathering of knowledge and its application to the design and implementation of software reengineering tools; development of integrated tools using available COTS technologies; and development of training in the methodology and use of the reengineering tools.

Principals: Charles Hoffman, Ph.D.
Market: Software development industries
Technology: JSC software REAP and COSTMODLER
Financing: Not looking at financing at this time.

First Contact	Apr. 94	NASA Connection	JSC Space Act Agreement in development
In Incubator	Sept. 94	Management Team	CEO, CTO
Business Plan	Dec. 94	Product Status	Existing product expanded
First Customer	3 Q 95	Current Financing	$10,000
		Financing Sought	TBD
		Current Jobs	2

Terminated Companies

Literacy Technologies International (LTI)

Investigated application of NASA computer-aided training technologies to the field of education, particularly in the development of adult literacy tools. Technology determined to be inadequate for this application. (Provisional Status Terminated 11/30/94)

Principals: Sherry Lowry
Market: Education.
Technology: JSC computer aided training technologies
Financing:

First Contact	Apr. 94	NASA Connection	NASA software
In Incubator	July 94	Management Team	CEO
Business Plan		Product Status	In development
First Customer		Current Financing	$15,000
		Financing Sought	

O²Code Development Company

Supplies Object Oriented tools for use in the development of new software. (Provisional Status Terminated 2/28/95 - principals unable to come to terms over ownership issues)

Principals: Olivia Carey
Market: Software development organizations
Technology: JSC licensed object oriented software
Financing: Determining financing needs.

First Contact	Aug. 94	NASA Connection	Space Act Agreement
In Incubator	Oct. 94	Management Team	CEO, COO
Business Plan	Dec. 94	Product Status	Ready for beta testing
First Customer	1 Q 95	Current Financing	$10,000
		Financing Sought	TBD

Wolverton Products

Manufactures and market portable indoor air purifying and humidifying systems developed at NASA.

Principals: Bill Wolverton

Market: Schools, doctor offices, offices, hotels, homes.

Technology: NASA patent from Stennis Research Center. Air purifying and humidifying systems utilizing live plants and beneficial microorganisms.

Financing: Business Plan to raise $2,000,000 for start-up. Currently has signed a 60 day option agreement with Ohio Medical Corporation for sales and marketing.

First Contact	Aug. 94	NASA Connection	Stennis patent
In Incubator	Oct. 94	Management Team	CEO, VP Mkt.
Business Plan	Dec. 94	Product Status	Prototypes complete
First Customer	3 Q 95	Current Financing	$10,000 (private funds)
		Financing Sought	$2,000,000
		Current Jobs	3

Appendix D. JTCC Company Financing

	Personal Investment	Outside Equity Investment	Government Funds	Working Capital	Total
Tenants					
AdvanTex	$ 10,000			$ 47,000	$ 57,000
Aphelion Robotics	$ 75,000			$ 750,000	$ 825,000
Hazard Analytics	$ 90,000				$ 90,000
Jack Rabbit Productions		$ 100,000			$ 100,000
Laser Professor	$ 100,000			$ 470,000	$ 570,000
Tenagra	$ 13,000	$ 5,000	$ 70,000	$ 291,000	$ 379,000
Valley Tech	$ 200,000		$ 65,000	$ 95,000	$ 360,000
Tenants	**$ 488,000**	**$ 105,000**	**$ 135,000**	**$ 1,653,000**	**$ 2,381,000**
Without Walls					
Information Clearinghouse	$ 10,000				$ 10,000
Kingwood Systems	$ 325,000	$ 100,000		$ 1,037,000	$ 1,462,000
Modulus Technologies	$ 225,000		$ 75,000	$ 450,000	$ 750,000
Ortech			$ 540,000	$ 488,000	$ 1,028,000
ReSoft	$ 10,000				$ 10,000
Wolverton Products	$ 10,000			$ 100,000	$ 110,000
Without Walls	**$ 580,000**	**$ 100,000**	**$ 615,000**	**$ 2,075,000**	**$ 3,370,000**
Left Incubator					
Literacy Technologies	$ 15,000				$ 15,000
Applied Information Sciences	$ 10,000				$ 10,000
O2Code	$ 10,000				$ 10,000
Left Incubator	**$ 35,000**	**$ -**	**$ -**	**$ -**	**$ 35,000**
Total - All Companies	**$ 1,103,000**	**$ 205,000**	**$ 750,000**	**$ 3,728,000**	**$ 5,786,000**